Economic and Health Issues

Alan Krupnick, PhD
Senior Fellow,
Resources for the Future

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State of Play

- CAIR
- CAMR
  - Trading vs. cap
  - 12/06: 23 states adopted tighter Hg cap than EPA; 13 not trading:
- Virginia
  - Large companies have restrictions on trading (purchases)
  - Largest meets cap by 2015 instead of 2018

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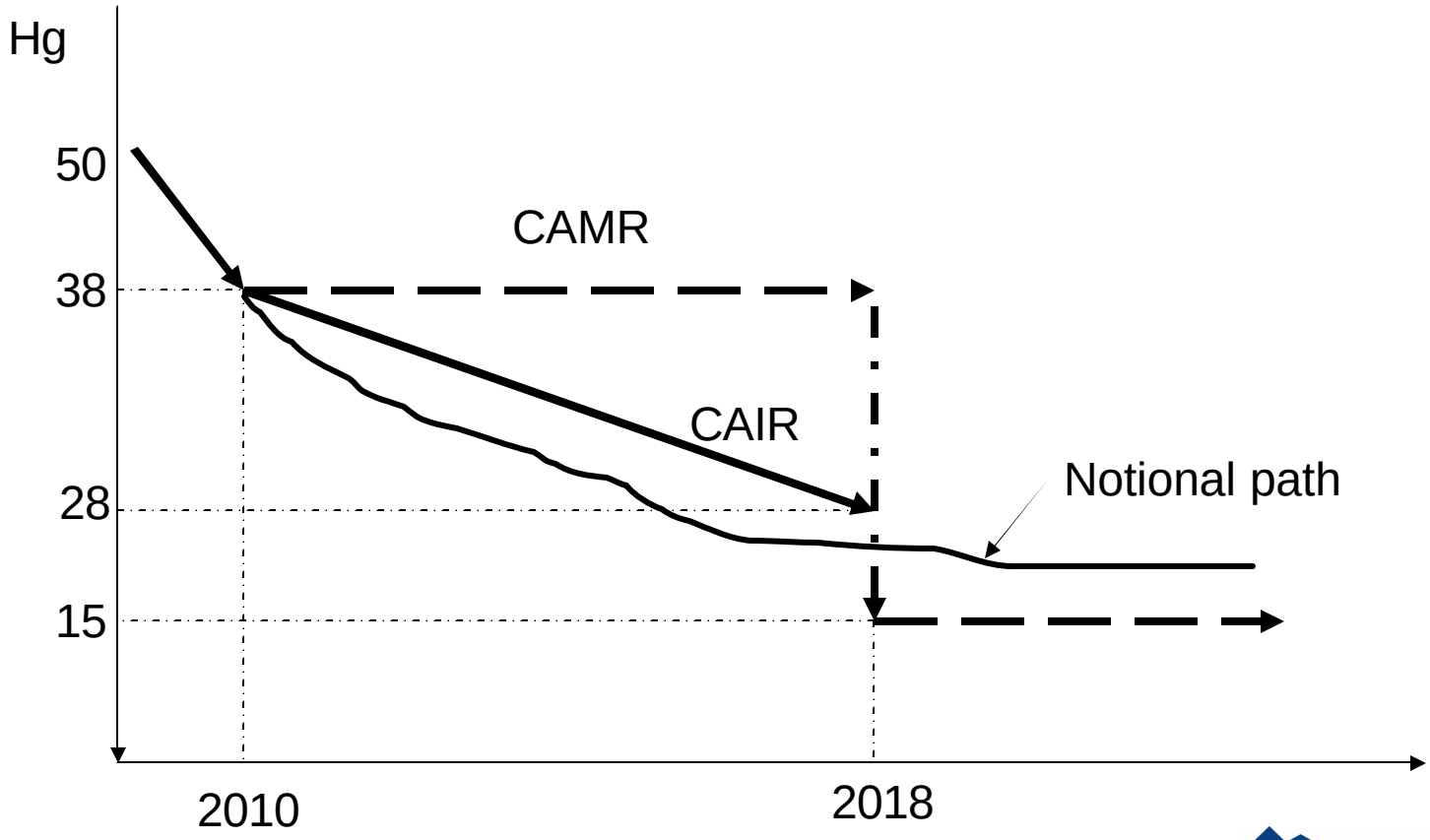
CAIR vs. CAMR



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Hg Regulation
Cost-Benefit Analyses

- Virginia to do (2006 House Bill 1055)
- EPA's RIA (2005)
- Gayer and Hahn (2006)
- Jakus, McGuinness, and Krupnick (2002) (CBA of a recreational fish advisory on bass in the Chesapeake bay)
- Palmer, Burtraw and Shih (2005)
- Rice and Hammitt (2005)
- Trasande, Landrigan, and Schechter (2005) and Griffiths, McGartland and Miller (2007)

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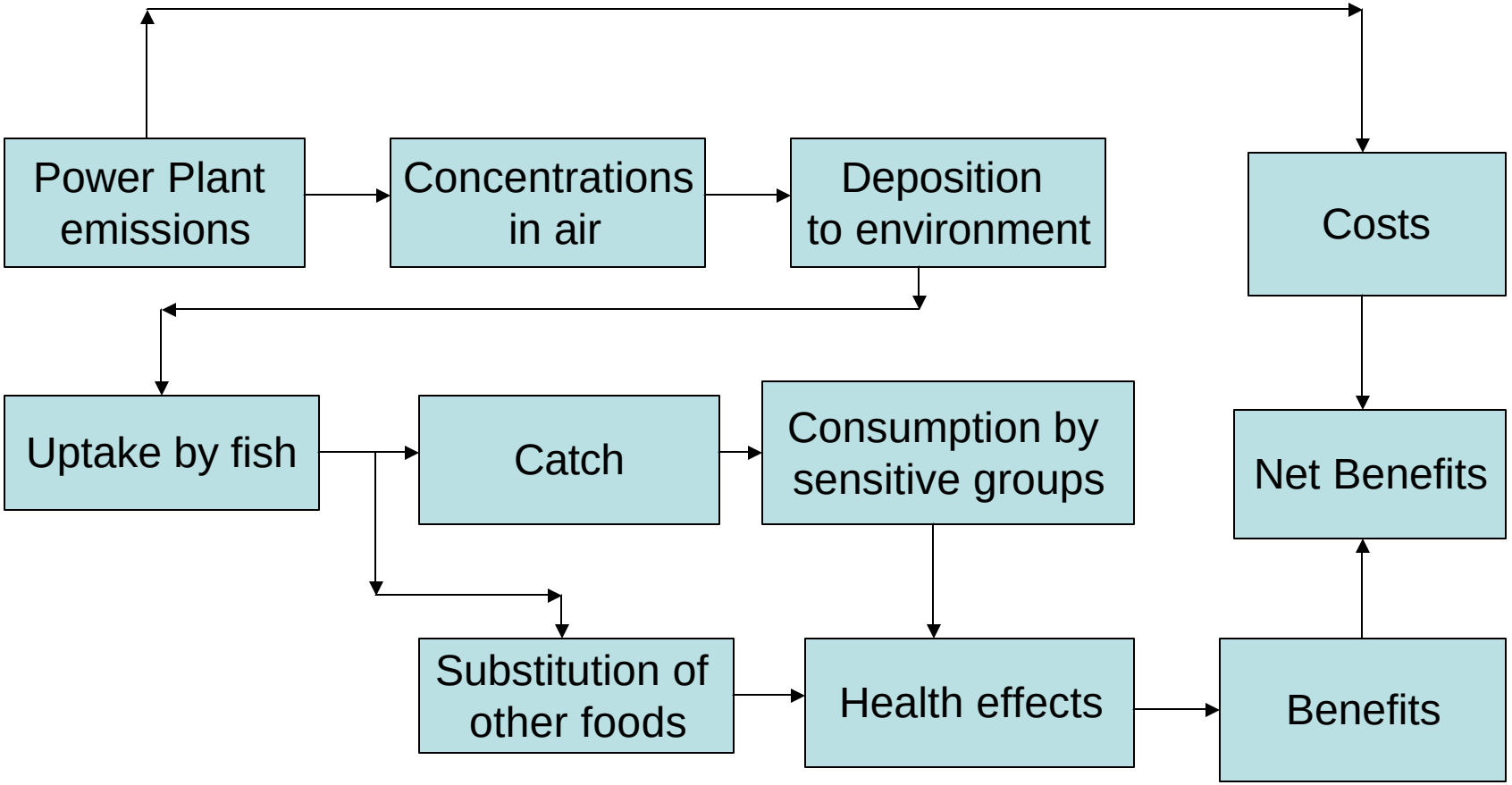
Flow Chart for Mercury Costs and Benefits



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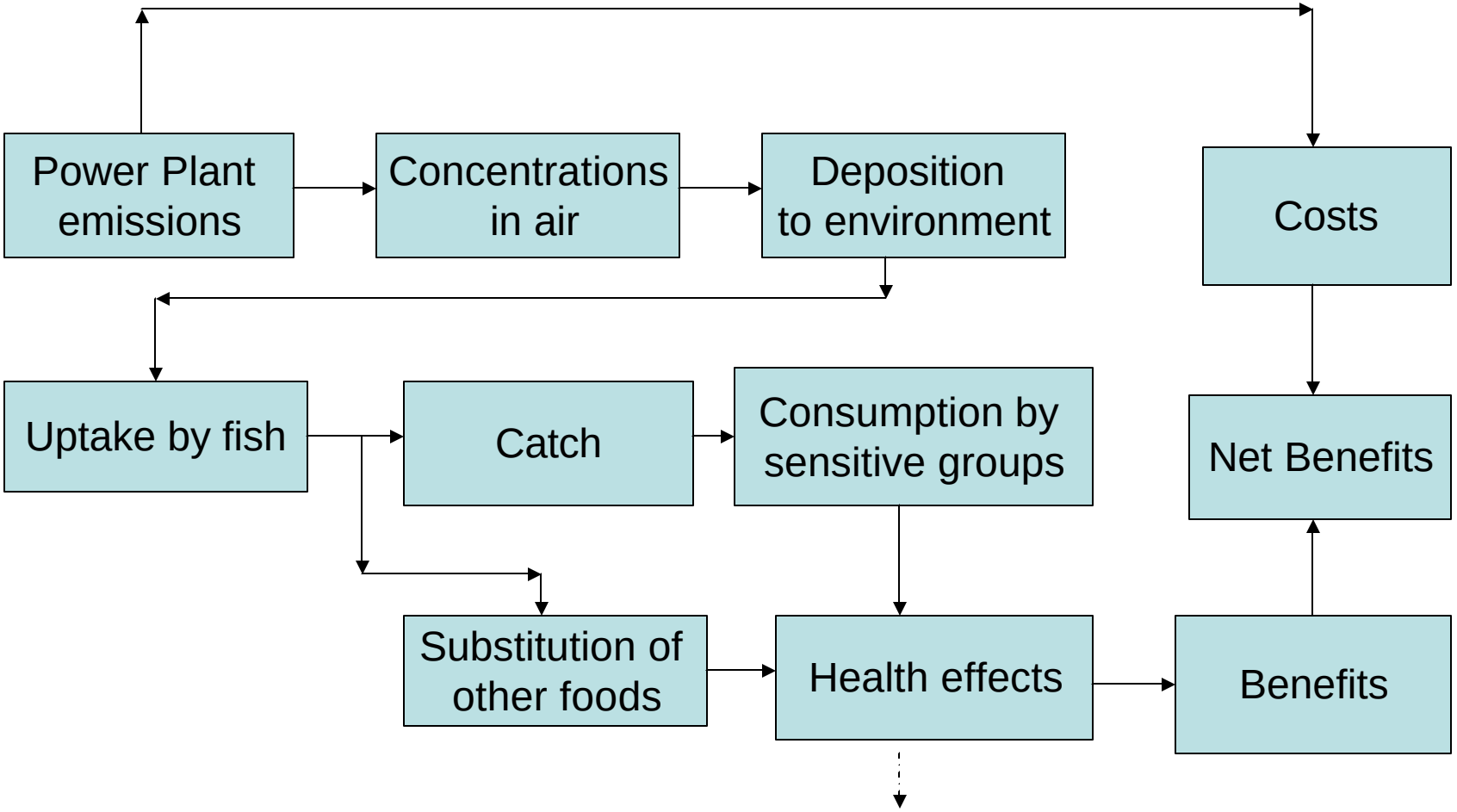

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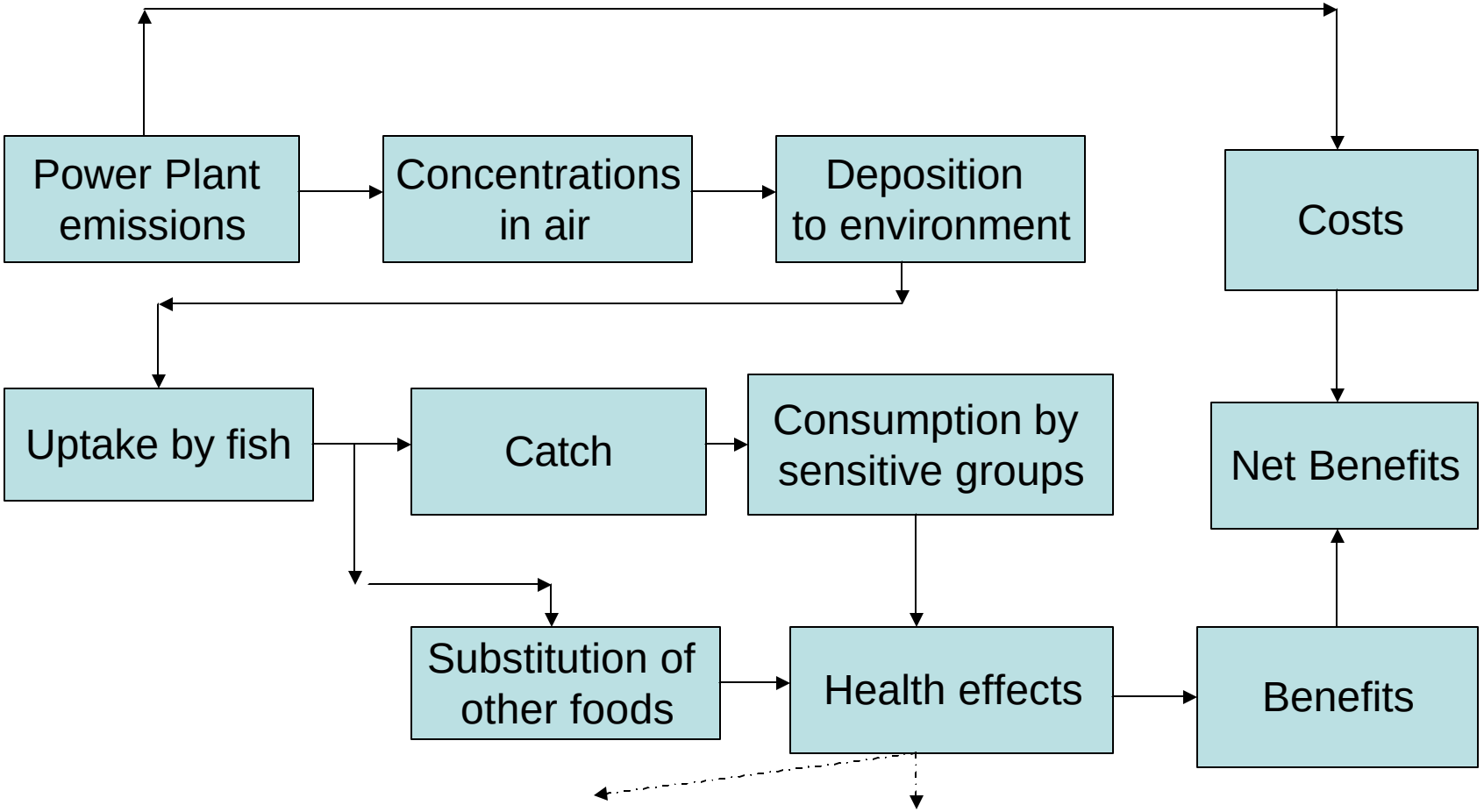

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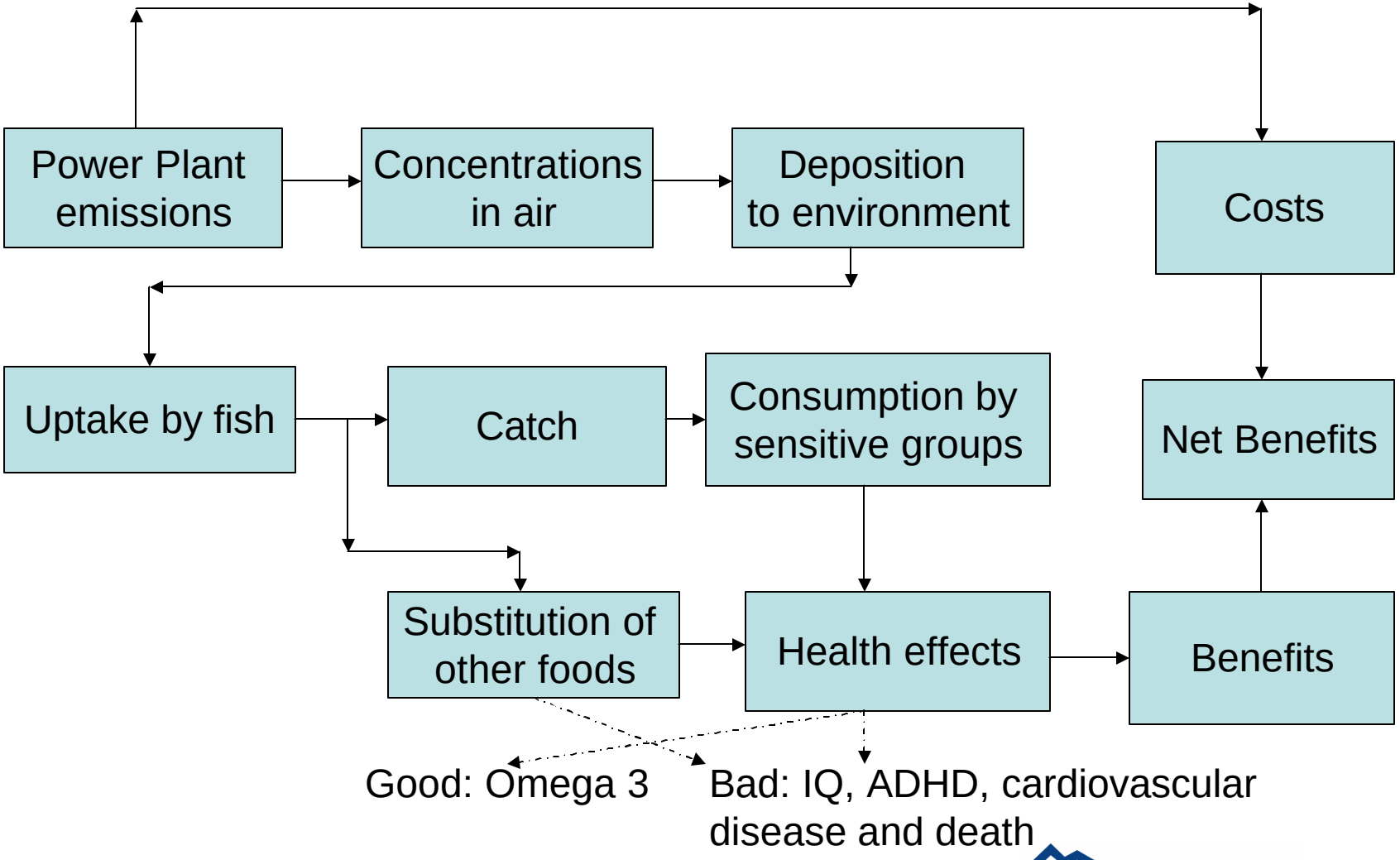

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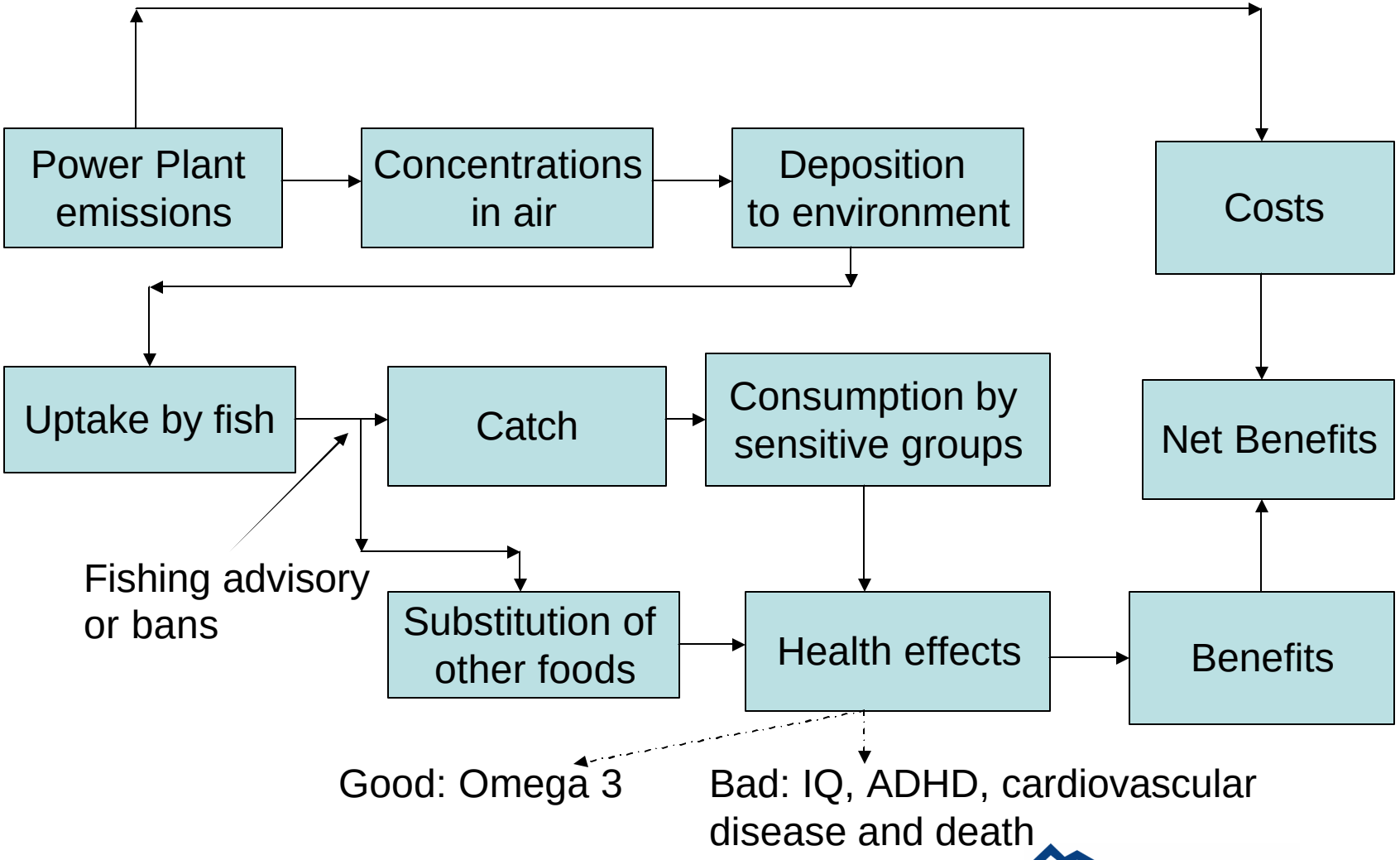

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BCA Results

- EPA's RIA
  - CAIR: Almost all benefits are from fine PM reductions; lots of Hg reductions
  - CAMR: (benefits for IQ only)
    - With MACT on top of CAIR
    - With cap and trading with banking of Hg on top of CAIR
- Gayer and Hahn
  - benefits for IQ only
  - With MACT on top of CAIR
  - With cap and trading with banking of Hg on top of CAIR
- Griffiths, McGartland and Miller
  - benefits for IQ only
  - Benefit of CAMR
- Palmer, Burtraw and Shih
  - Benefits of CAMR (IQ plus cardiovascular mortality)

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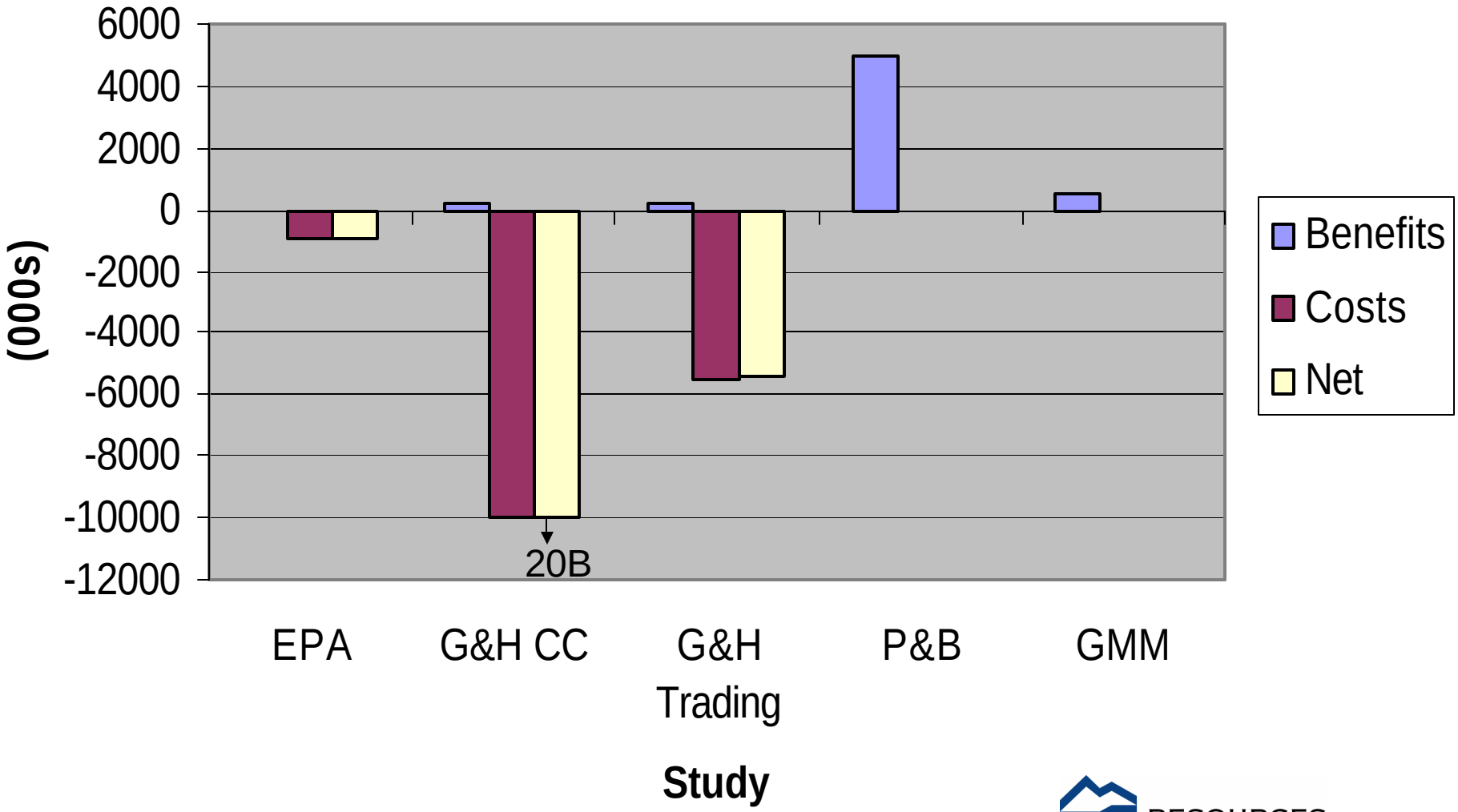
BCA for CAMR beyond CARE
(2004$)



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Health Effects History

- Interest in Hg began after Minimata incident in 50's (deaths, blindness and neurological damage from eating fish)
- Early 1970s, deaths and hospitalization from eating grain products treated with fungicide containing methyl mercury
- 1995: FDA issues advisory to limit consumption of shark and swordfish to <= one serving per week; pregnant women: <= 1/mo.
- 2001: FDA withdraws general advisory and tightens it for pregnant women
- FDA and EPA issue new advisory expanding to breast feeding women, children and women who were trying to become pregnant: <= 12 oz fish and seafood; 6 oz. Albacore tuna/wk
- Do advisories work? Harvard study: After 2001, fish consumption among 2,000 pregnant women dropped by ½ serving from 2 per week. RFF study: lots of slippage from advisory to reduced health effects.

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More History

- UK Study in *Lancet:* Child IQ, test score, ADHD effects from women eating < 12 oz fish /week during pregnancy
- Seychelles 20 yr longitudinal study: No adverse effects
- Faroe Islands study: Slight neurological effects to children of mothers who ate whales (high Hg and high selenium.
- Finland study: men with highest hair Hg had a 2.0-fold increased risk of acute myocardial infarction relative to the other groups.
- Virtanen et al. (2005) follow-up (13 years) finds high mercury content in hair increased the risk of cardiovascular morbidity and mortality and attenuated the beneficial effects of fish oils on cardiovascular health.

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What's good about fish

- Fish is rich in protein, generally low in calories and packed with omega-3 fatty acids, and generally lower in contaminants than some other high protein foods.
- The National Academy of Sciences, the American Heart Association and the 2005 U.S. Dietary Guidelines (as well as EPA and FDA) advise eating about two meals of fish per week
- Omega-3s are essential fats key to fetal brain development and improve mood (including postpartum depression. May decrease the risk of having a preterm baby.

➔Eat fish that is low in mercury, particularly when pregnant (salmon, sardines, tilapia, anchovies, shrimp and light tuna. Can take fish oil supplements to get benefits.

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Omega-3	Mercury	Cost per serving:
Highest ■■■■	Highest ■■■■	$ = About $1 or less
Higher ■■■	High ■■■	$$ = About $1 to $3
High ■■	Lower ■■	$$$ = About $3 to $6
Moderate ■	Lowest ■	$$$$ = About $6 and higher

FISH/SEAFOOD	OMEGA-3	MERCURY	COST
Shrimp Baked, boiled, steamed, canned	■	—	$$$
Shrimp Breaded and fried	—	—	$$$
Tuna Light canned	■■■	■■	$
Tuna White canned *(albacore)*	■■■■	■■■	$
Tuna Fresh grilled bluefin	■	■■■	$$$
Tuna Fresh grilled yellowfin	■	■■■	$$$
Salmon Canned	■■■■	—	$
Salmon Farm-raised	■■■■	■	$$
Salmon Wild	■■■■	■	$$-$$$
Catfish	■	■	$$
Tilapia	■	■	$$
Crab Blue	■■■	■	$$-$$$$
Crab Alaska king	■	■	$$-$$$$
Cod	■	■■	$$
Clams	■■	—	$

SOURCES: National Marine Fisheries Service; H.M. Johnson & Associates; National Fisheries

Swordfish: ■■■■ ■■■■ $$$-$$$$

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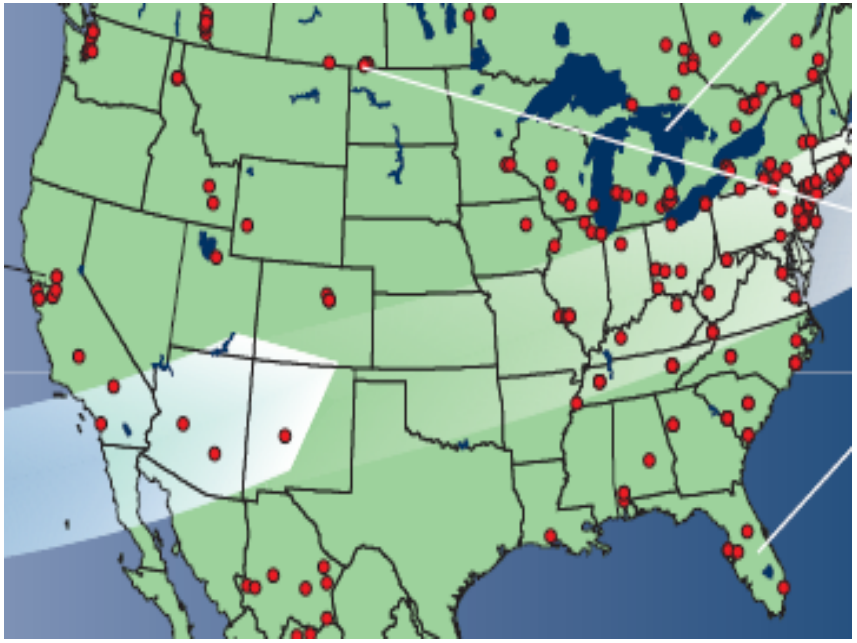
Valuation studies of Health Effects

- IQ point:
  - Lifetime earnings: EPA: $8,807 per IQ lost ($1999);
    TLS and GMM: $7,121 per boy and $5,268 per girl (2000$);
  - WTP: G&H: low-end $1,295 and high-end $2,236 (2004$) per IQ lost
  - WTP: $10,420 (2000$) per IQ lost from Rowe et al. (1995)
  - Cost of illness: R&H:$16,500 per IQ lost (2000$)
- Mortality:
  - Value of Statistical Life: BPS: $2.2;$5.8 million; R&H:$6 million, JMK: $700K; $6 million
  - Cost of illness: R&H: $50,000 per myocardial infarction

Hotspots

- 244 mercury hot spots in North America, where the amount of mercury contamination exceeds naturally occurring
- EPRI believes that the hot spots won't be intensified under the CAMR trading program
- Note that Hg will be coming down overall
- Hotspots should be measured from old not new baseline
- Environmental justice concerns should be treated the same way.
- If there's a problem use local authority to address.



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Allowance allocation

- Emission budget for each state: share of cap
- EPA Guidance: Free allowances – updated based on heat input adjusted according to fuel type.
- States can do what they want

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Auction

- Advantage: cost-effective; flexible to policy maker; able to generate revenue ; doesn't favor incumbent firms
- Disadvantage: higher electricity price in regulated (cost of service) regions
- Possible use of revenues:
  - Compensation to consumers; investment in technology improvement; support to other environmental friendly programs; etc
  - However, improving energy efficiency would draw down the allowance price due to the decrease in demand.

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Conclusions

- ➔Estimated costs for CAMR far exceed estimated benefits
  - ➔Remember not to count ancillary particulates reductions unless they exceed mandated levels and with no trading on SO2 and NOX. With trading, price falls, but no health benefits.
  - ➔Results very sensitive to Hg-mortality link;
- ➔Join the trading program
- ➔Regulate PM more; not as ancillary to Hg
- ➔Don’t worry too much about hotspots
- ➔Consider auctions

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